

BAHRAIN INITIATIVES

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Al Areen, 7 December 2009

KYOTO, COPENHAGEN AND BEYOND

The Likely Impact of Response Measures
on Petroleum-Producing Countries



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Preamble



Our aim is to
inform policy,
not to promote
a political
cause

- A comprehensive talk on petroleum-producing countries and climate change should tackle three issues:
 - First, their vulnerability to a changing climate
 - Second, their mitigation policy and programs
 - Third, the impact of “response measures”
- Our focus is on the third, i.e. the impact on their petroleum-dependent economies of implementation of response measures by industrialized countries

Presentation outline



Today, 7 December 2009, 56 major newspapers in 45 countries have taken the unprecedented step of speaking with one voice on climate change ahead of the Copenhagen summit. They've done it by publishing the same editorial calling on rich countries to commit to deep cuts

- **Part I:** Background to Copenhagen
- **Part II:** The economic impact of response measures
 - How likely are producers to loose?
 - What policy responses?

Part I: Background to Copenhagen

Current regime and requirements



Current regime:

- 1992 Rio Convention (UNFCCC)
- 1997 Kyoto Protocol with commitment period 2008-2012

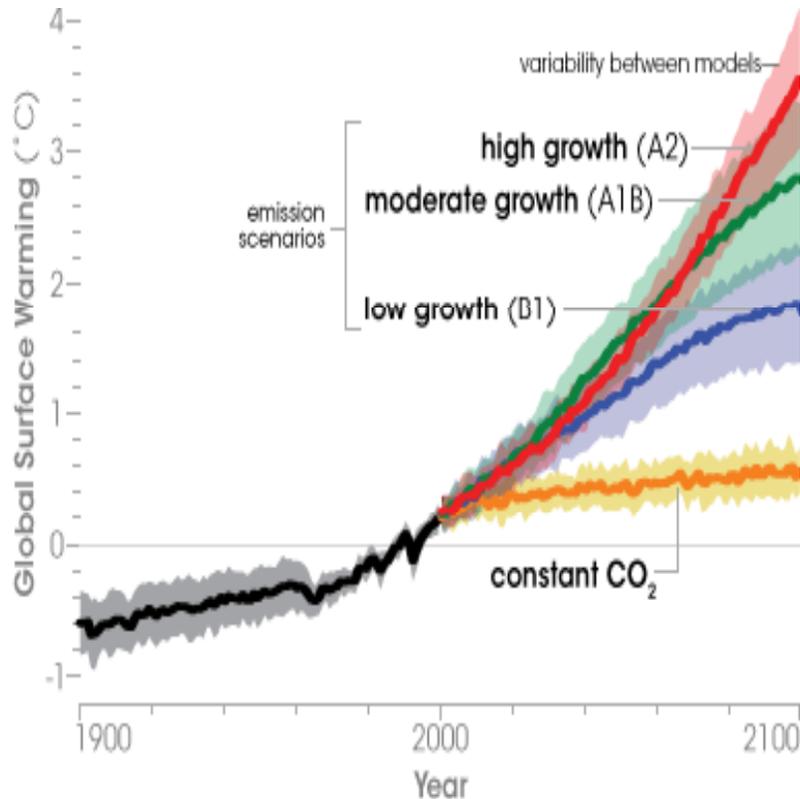
Kyoto Protocol requirements

- Annex I countries (industrialized): To reduce GHG to 5% below 1990 levels
- Annex II (Annex I OECD): To provide funding and transfer of technology to non-Annex I countries
- Non-Annex I (developing countries): No commitments



- USA sole country that has not ratified Kyoto

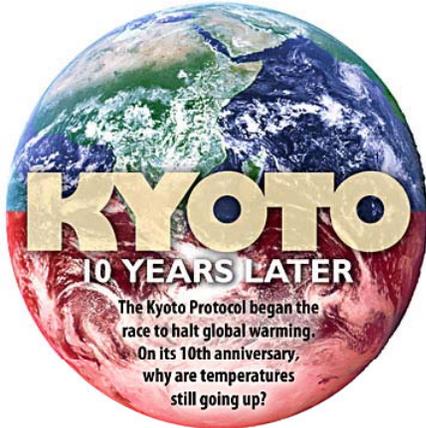
Despite remaining uncertainties, confidence in IPCC's latest recommendations (“Climate Change 2007”)



Source: NASA Earth Observatory, based on IPCC Fourth Assessment Report (2007)

- Limit the rise in Earth's temperature to 2°C above pre-industrial levels
- Equivalent to stabilizing GHGs in the atmosphere at below 450 ppm
- Either require global emissions
 - To peak before 2020
 - Be halved by 2050, vs. 1
 - Decrease further towards 2100

Road map to Copenhagen: reaffirmed principles

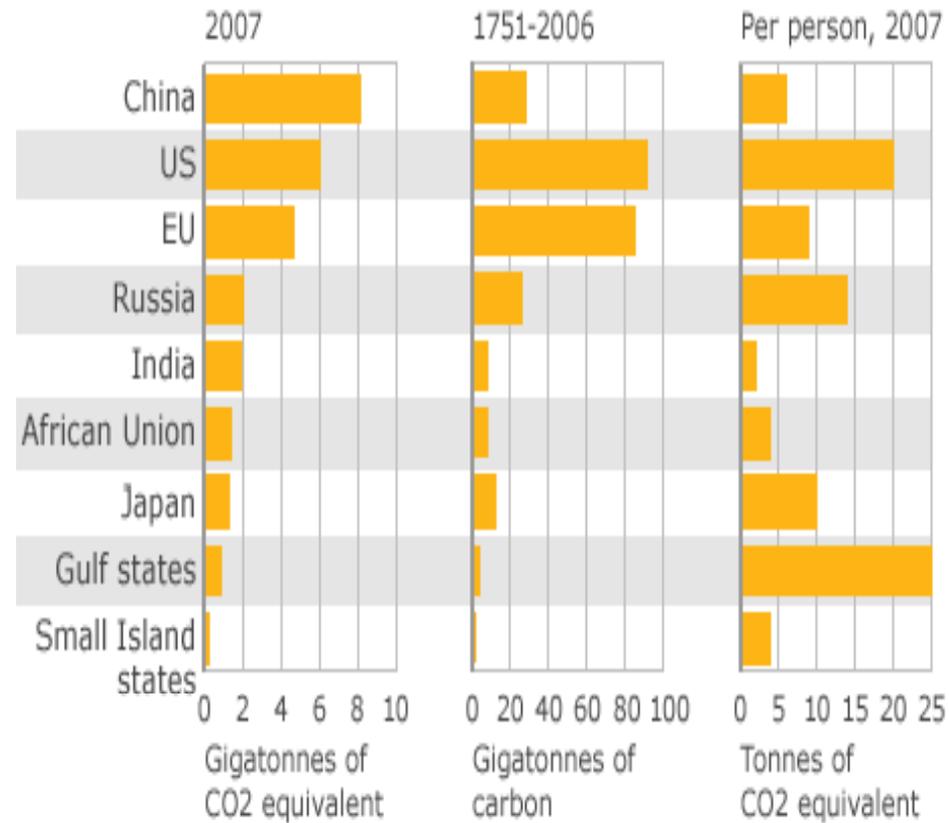


- Bali 2007: starting point for the appropriate political response to the IPCCs findings
- Emphasis on fairness, flexibility and inclusiveness
- Restating key principles and issues:
 - Common but differentiated responsibilities
 - Special needs and circumstances of DCs
 - Funding, technology transfer and capacity-building
 - Adverse consequences of response measures

Who's or has been emitting most?



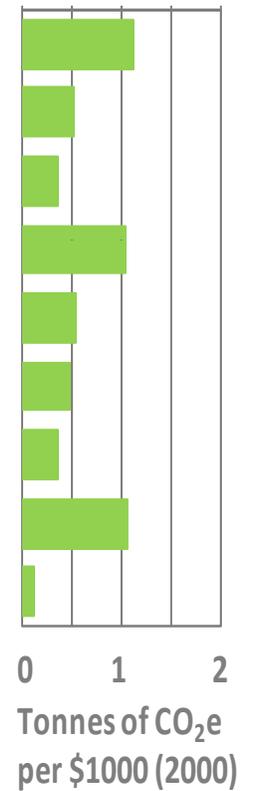
Three different ways to look at carbon emissions



Sources: CDIAC, Potsdam Institute for Climate Impact Research

And a fourth...

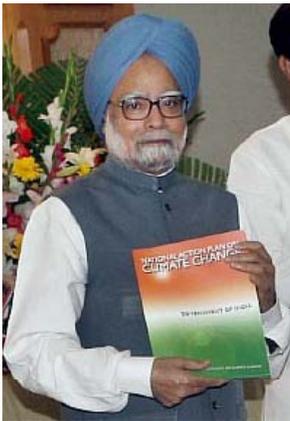
Carbon intensity using 2007 PPP



Pledges are not enough



G20 in Pittsburgh: Barak Obama and Hu Jintao agree to “help produce positive outcomes” at the Copenhagen conference”

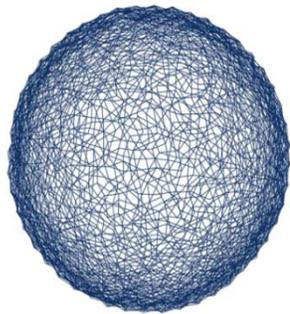


- UE: 20% cut below 1990 levels by 2020 (30% if strong agreement)
- Australia: 20% cut below 2000 levels
- Canada: to match USA
- **USA**: 17% cut below 2005 levels
- **China**: 40% to 45% cut in carbon intensity (CO₂ emissions per GDP) below 2005 levels
- **India**: 20% to 25% cut in carbon intensity below 2005 levels

Copenhagen: critical political points



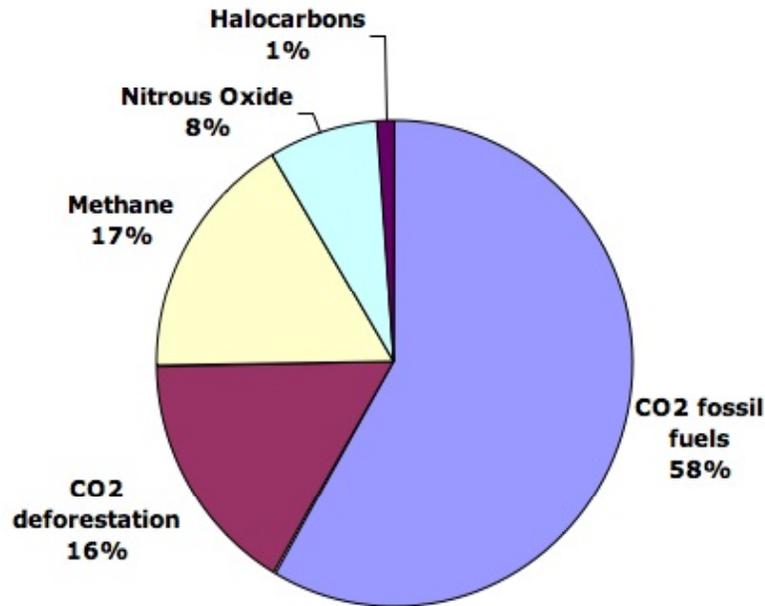
- How far are the industrialized countries willing to go to reduce their GHG emissions?
- Will the USA, Canada and Australia be fully on board?
- How much are China and India, *inter alia*, willing to do to limit the growth of their emissions?
- How much funds for climate change mitigation and adaptation in developing countries
- How to structure a new financing agreement (institutional and governance arrangements)



COP15
COPENHAGEN
UN CLIMATE CHANGE CONFERENCE 2009

Part II: The Likely Impact of Response Measures on Petroleum-Producing Countries

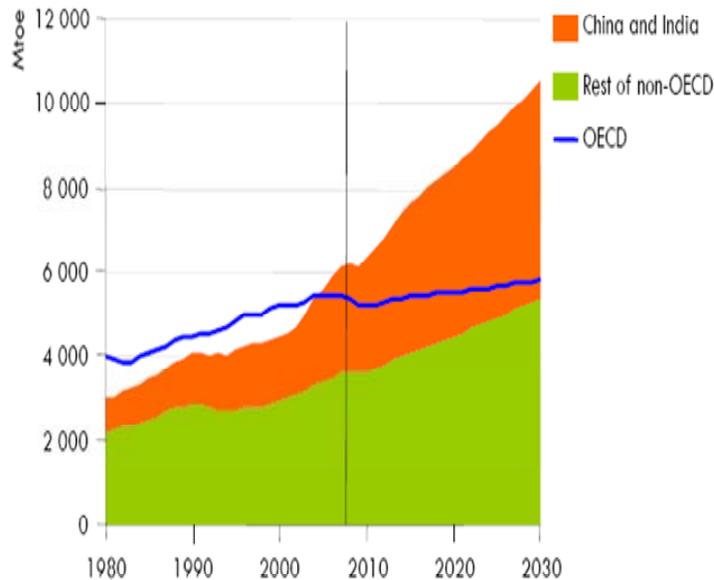
Fossil fuels, the main culprit of GHGs emissions



Source: IPCC, 2007

- Coal, oil and natural gas account for about 60% of the world's greenhouse-gas emissions
- Energy at the heart of climate policy mitigation
- Implications in terms of higher costs for end-users and lower revenues for primary suppliers

IEA Study Highlights – The Reference Scenario

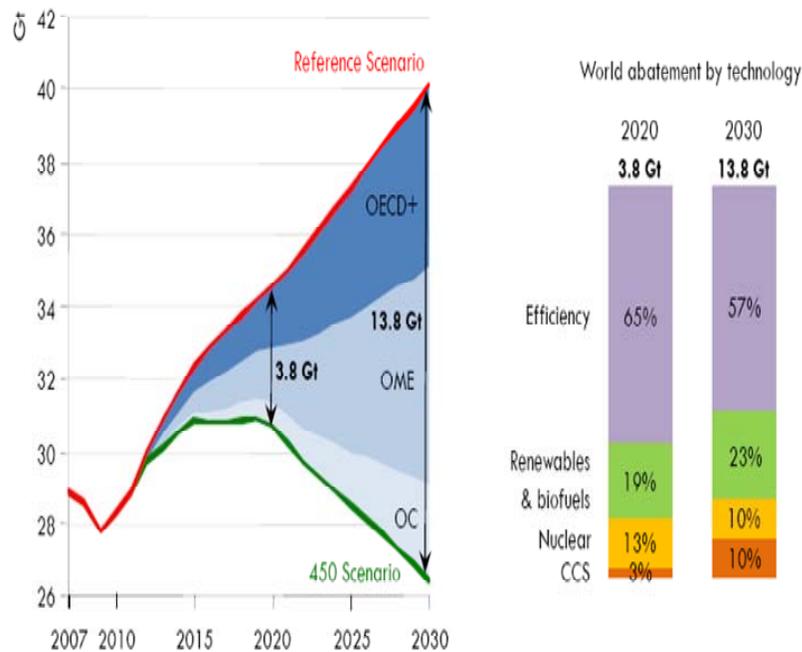


Non-OECD countries account for 93% of the increase in global demand between 2007 & 2030, driven largely by China & India

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- Global energy demand increases by 40% to 16.8 billion toe in 2030
- Fossil fuels dominate the energy mix, accounting for 77% of incremental demand
- Non-OECD countries account for 93% of the increase
- China and India alone for over half the increase

IEA Study Highlights – the 450 Scenario



An additional \$10.5 trillion of investment is needed in total in the 450 Scenario, with measures to boost energy efficiency accounting for most of the abatement through to 2030

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- Focus on energy-related CO₂ emissions , consistent with stabilizing all GHGs at 450 ppm
- Key mitigators include energy efficiency, renewables, biofuels, nuclear and CCS
- CO₂ emissions peak just before 2020 at 30.9 Gt then decline steadily to 26.4 Gt in 2030
- At an additional cumulative investment cost of \$10.5 trillion

The IEA “authoritative” assessment of OPEC’s long term cumulative petroleum export revenues



Nobuo Tanaka (IEA) and Abdalla Salem El-Badri (OPEC) in a “friendly and cooperative mood”

“Although lower than in the reference scenario, OPEC revenues for oil and gas exports in the 450 scenario increase to \$23 trillion between 2008 and 2030, a four-fold increase compared to the period 1985-2007.”

Source: IEA (2009), “How the Energy Sector Can Deliver on a Climate Agreement in Copenhagen”, Special early excerpt of the World Energy Outlook 2009 for the Bangkok UNFCCC meeting, page 12.

Asymmetries and vulnerabilities



Main aggregates 2008	Unit	IEA countries	OPEC countries	GCC countries
Average oil price	US\$/bbl	97.19 cif	94.45 fob	
Share of energy imports in total imports	%	20.5	1.4	2.3
Share of energy exports in total exports	%	10.1	84.5	74.6
Share of energy trade in GDP	%	6.8	43.7	49.4
Share of petroleum taxes in budget revenues	%	7.1	72.3	79.7

Source: APICORP Research
All underlying data from IEA/OECD, OPEC and GCC

- Asymmetries characterized by key macro-economic anomalies
- Vulnerabilities stem from the structures of trade, GDP and budgets

Our model: the “permanent petroleum revenue”

- Derives from Milton Friedman’s PIH
- Provide a simple framework to assess fiscal sustainability
- Sustainable government spending determined by the annuity value of expected petroleum wealth

$$GC_{t+H} = GC = r \times \left[F_t + \sum_{i=0}^I \frac{T_{t+H+i}}{(1+r)^i} \right]$$

- GC: Constant government spending
- F: Value of sovereign wealth fund
- T: Taxes (royalties and petroleum taxes)
- r: Discount factor/Return on petroleum assets

Assumptions: neither black nor gray swans



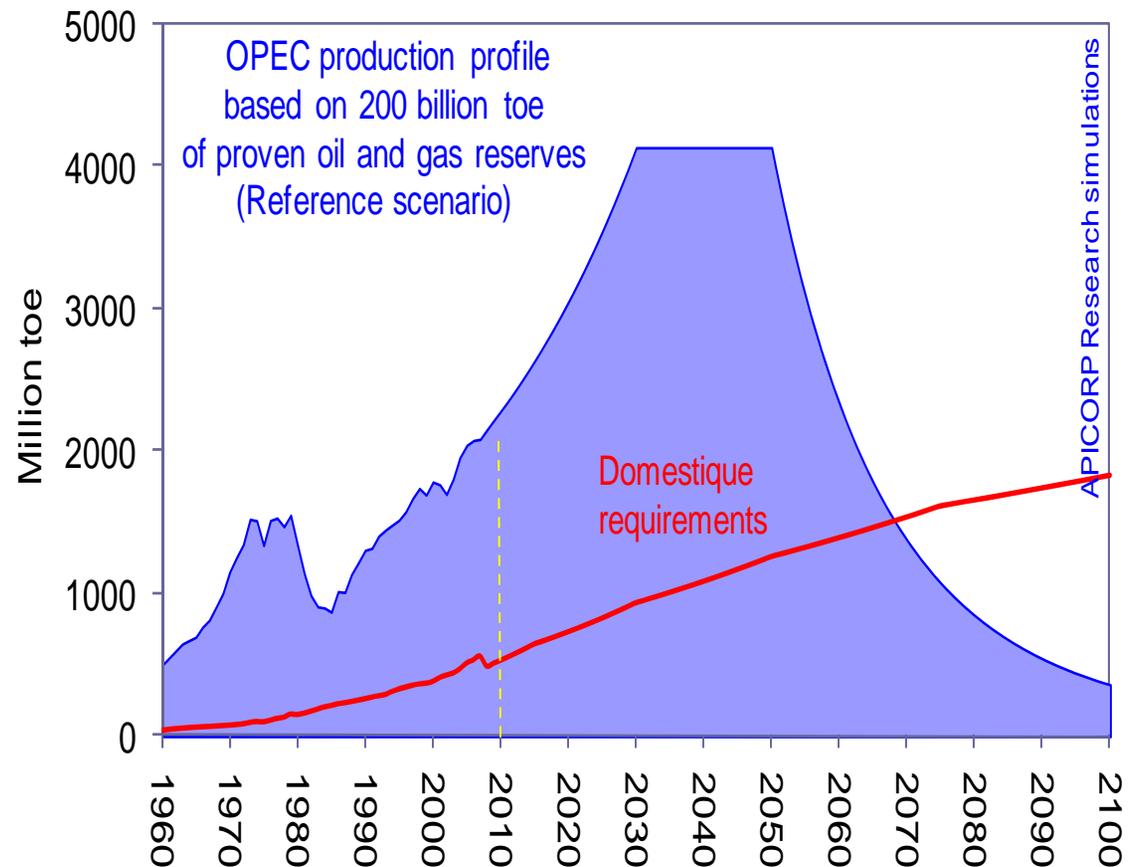
Because assumptions are usually implicit and unstated, they go unchallenged and unquestioned

	Key assumptions	Further approximations
Petroleum proven reserves	200 Gtoe	+20% Y-to-F
R/(2008)P ratio	94 years	Simulation horizon 2100
Petroleum export prices	0.70 of Dated Brent	Prices moving together
Domestic pricing	At average cost	No rent extracted
Governments' take	65% of export values	Past 5-year calibration
Population dynamics	613 million in 2008	Doubling in 2050

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What an OPEC production profile looks like

- Base case scenario rests on previous key assumptions and IEA's Ref Scenario
- Alternative scenario rests on previous key assumptions and IEA's 450 Scenario



NPVs of petroleum fiscal revenues per capita



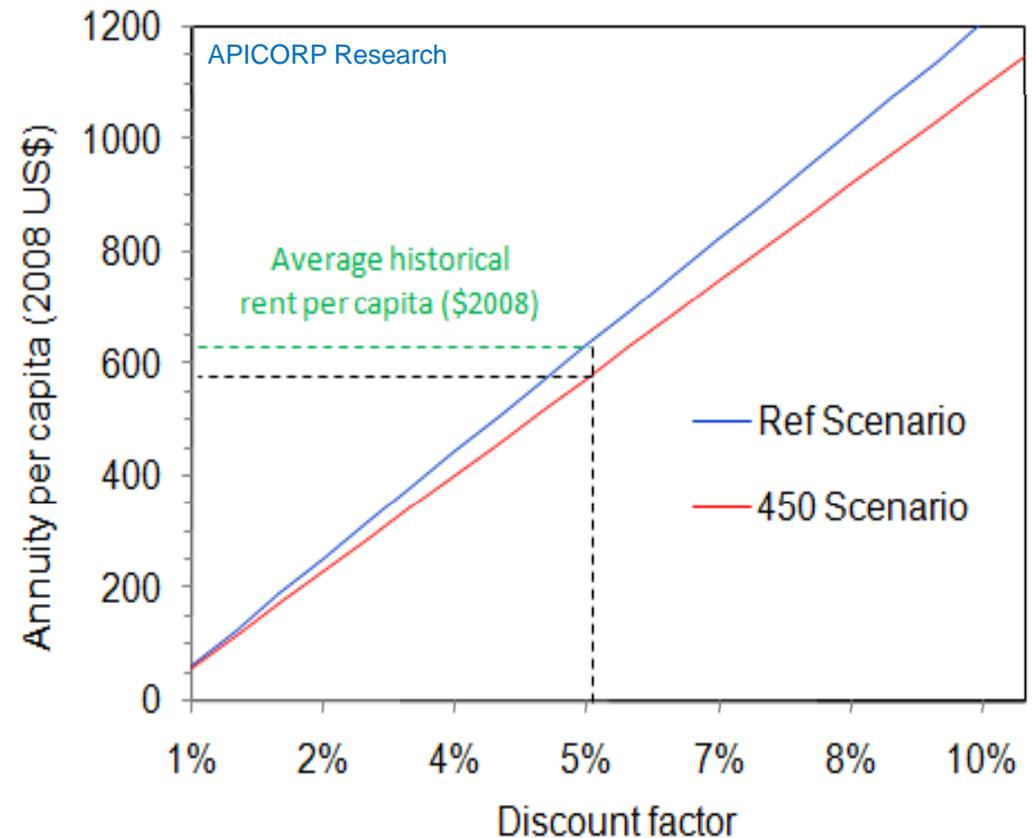
Excel spreadsheet has no brain. Use yours...

Based on projections over the period 2009-2100		Units	Net present petroleum fiscal value (NPVPFR) based on a discount rate of 5 percent		
Reference oil price		US\$/bbl	50	75	100
Ref Scenario	NPVPFR per capita	US\$	8,465	12,700	16,930
	Corresponding annuity present value	US\$	430	640	850
	Ratio to per cap historic rent	Unit	0.70	1.05	1.40
450 Scenario	NPVPFR per capita	US\$	7,660	11,490	15,320
	Corresponding annuity present value	US\$	390	580	770
	Ratio to per cap historic rent	Unit	0.64	0.95	1.30

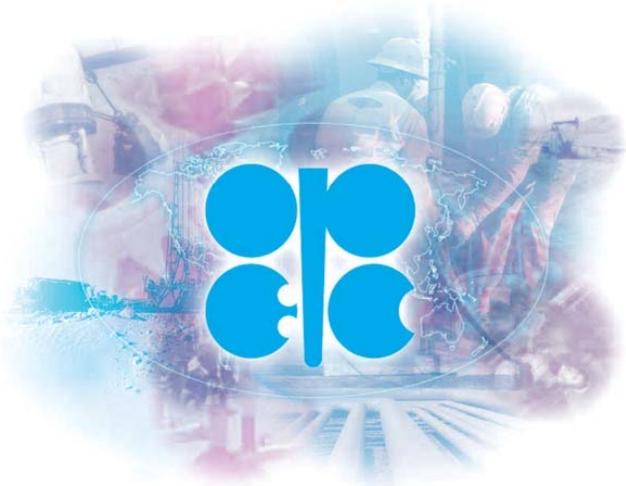
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Question marks on OPEC fiscal sustainability

- What annuity value OPEC countries would be “fiscally comfortable” with?
- An annuity equivalent to historical record involves \$75/bbl price under the IEA reference scenario
- Under this price, the 450 Scenario entails a lower rent per capita than historical realizations



Producers' stance and response



OPEC 3rd Summit, Riyadh Nov 2007



- Industrialized countries should assume historical responsibility for climate change
- Policies and measures should take into account the impact on DCs, including petroleum exporters
- Mitigation should favor the development of key technologies including carbon capture and storage

Conclusions: turning a threat into an opportunity

**It's the
non-petroleum
eco₂nomy,
stupid!**

A rude, Clinton-like
quote in climate
politics

- Actions to curb emissions of GHG can have important effects on world petroleum markets
- The much publicized IEA assessment overlooks cost, population dynamics and time preferences
- Petroleum producers should expect tangible losses on export-based fiscal revenues
- Producers can only hope for a rapid deployment of technologies with mitigation potential such as CCS
- Ultimately, the threat of revenue losses should be turned into an opportunity to accelerate economic diversification